

Explosives Safety Bulletin

September 2010

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Engineering Controls

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By: Explosives Safety Knowledge, MEC,
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Engineering controls are designed to reduce or eliminate fragmentation and/or blast effects either by suppression of the source of detonation or by protection at the exposed location, or both. Barricades, shields, contained detonation chambers, and “zero QD” magazines are examples of engineering controls.

Engineering controls are designed and tested in a rigorous fashion. The construction of the engineering control must be carefully duplicated in field applications to assure it will function properly. For example, if the drawing for a shield specifies 4140 steel, a seemingly innocuous substitution of 1040 steel during construction could result in the shield's failure to defeat primary fragments in the event of accidental detonation. Similarly, if a shield was designed and tested to defeat primary fragments from a 105mm HE projectile, use of such a shield for protection from 155mm HE projectiles exposes personnel to fragment injury due to the greater fragment penetration capability of the 155mm HE projectile.

It is thus imperative that engineering controls be built exactly in accordance with the design package, and that they be used only for the munitions for which they are authorized.

Recently, an engineering control failed. Luckily, no one was hurt. Operators were using the control with an alternate explosive charge that had not been tested. As a result, the control failed to suppress primary fragments as designed, and fragments were projected into a populated area.

Build and use engineering controls per the design. Pictured below are a few examples of engineering controls for UXO cleanup operations.



Use of Field Erectable Shelter to Reduce QD to 200 ft (to side and rear)
When Excavating UXO



Use of Sandbags To Reduce QD to 200 ft (in all directions)
When Detonating UXO

Mark Your Calendars

The 2011 Army Explosive Safety Conference (AESC) will be held 21 – 23 June in Huntsville, AL. The conference will provide information of the current issues and challenges in explosives safety as well as provide information on new technologies and processes. Sample areas of discussion: Issues in-theater, less-than-lethal ammunition, and HERO. Additional information will be posted in the upcoming first quarter (2011) Explosives Safety Bulletin.

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Operations Allowed in Your Basic Load Ammunition Holding Area (BLAHA)

By: Explosives Safety Knowledge, MEC,
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You have arrived in theater and have been given the responsibility to be the final link in the logistics chain between the manufacturer and the end user. But you're not responsible for pizza and soda. Your area of expertise is ammunition and explosives (A&E). At garrison, you understood the rules and regulations. There was input from many sources on the proper way to operate an ammunition supply point. Now you have been given your own 16 cells at a Forward Operating Base (FOB). Each cell holds about six ISO containers. You need to store about 30,000 lbs Net Explosives Weight (NEW). Using your stubby pencil, you come up with about 2,000 lbs per cell. You even have room to store all your white phosphorous (WP) in its own cell. You look around and find a current risk assessment and license (that last guy was good). You even have a nice drawing of your BLAHA. Life is good.

Just when you are settling in to your new routine, the Sustainment Brigade (SB) informs you that your FOB is going to grow, and your ammunition mission is going to expand. Your BLAHA now needs to store 60,000 lbs NEW. You do quick math and know that 4,000 lbs per cell can't be all that bad. You still have your six ISO containers per cell. Of course the SB didn't tell you that the 60,000 lbs NEW doesn't count the NEW from your small arms, because "everyone knows" that the small arms 1.4 material doesn't count towards your total NEW per cell. You're still confident you can make this work... and gee, I hope they send help.

The truck loads of new A&E start arriving, according to some chaos theory, but they are arriving. Next thing you know, you get an Ammunition Information Notice that you need to inspect all your 7.62 stocks for some inverted primer mess up and your hand grenades may have an upside down stencil, please check that too. You're thinking, inspect who for what? Oh yeah, sure, and where?

This is where you sharpen your pencil. You remember DA Pam 385-64, Ammunition and

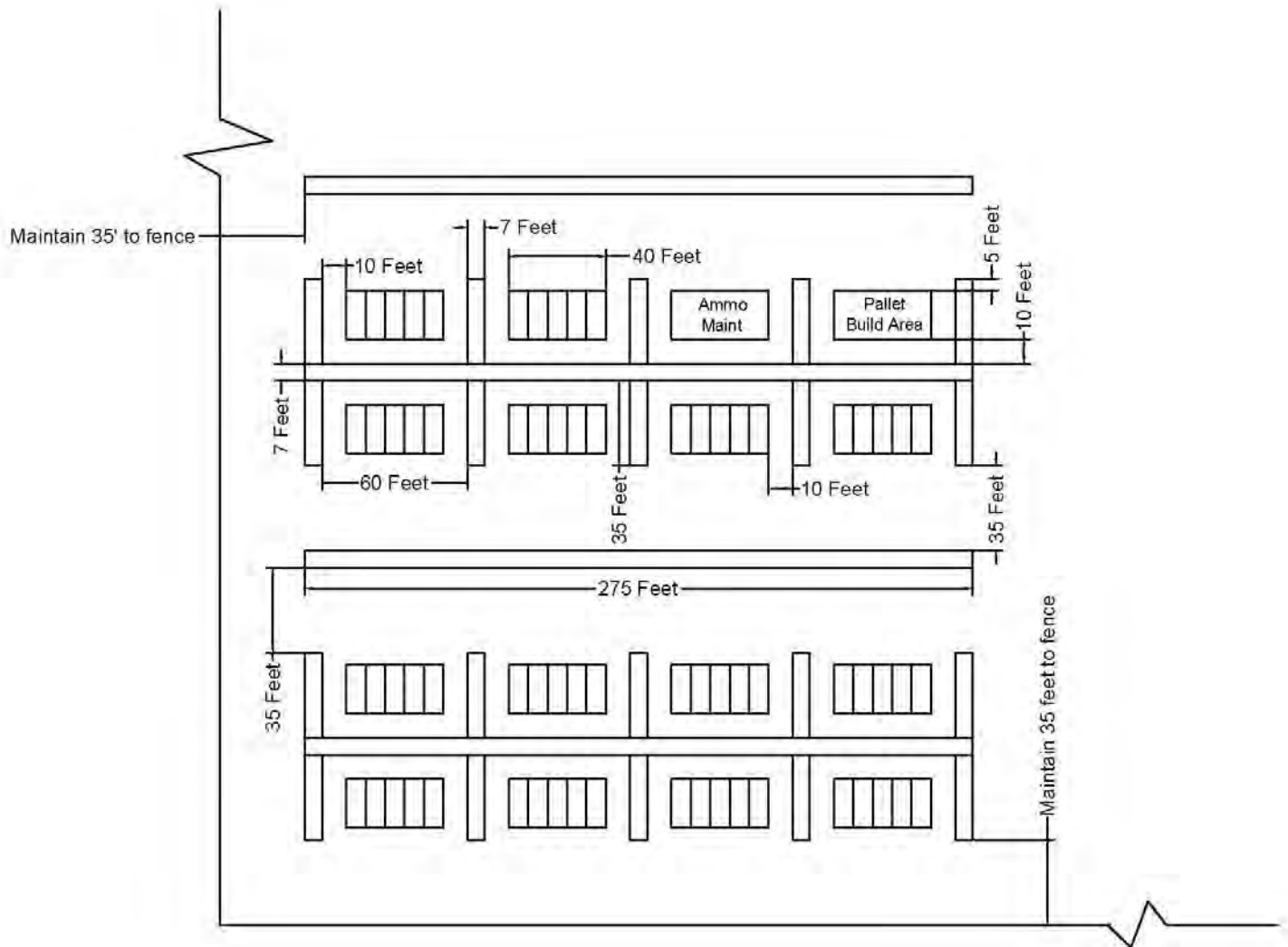
Explosives Safety Standards, paragraph 13-2 j, operations permitted outside of magazines. You know that your BLAHA cell is, well, like a magazine. Each cell is "intermagazine" distance apart. Paragraph 13-2j states that if "special facilities" are not available, inspection and repair may be done in the open as long as you maintain intermagazine distance or 100 feet, whichever is greater. It must be the 100 feet then, since the intermagazine distance for your BLAHA cells is 28 feet. Now you can find a spot in the open, 100 feet from your BLAHA cells, watching for line of sight back to the exposed A&E, and perform your inspection. Problem solved.

Wait, but this still doesn't solve all your problems. All that A&E keeps coming and going. The SB sends more and the units want more. You used to have no problem taking a unit out into the BLAHA and moving from cell to cell collecting their basic load (you still like your WP in its own cell). But now you really want to change the way you do business. You've decided to take two of your cells and change their purpose. Now your BLAHA will have 14 storage cells, one pad for shipping and receiving, and one pad for "maintenance". You remember paragraph 13-2i of the DA Pam 385-64 and it allows many types of operations inside and on the adjacent apron of magazine areas. 13-2i just requires that these operations be "incident" to storage, inspection, inventory, and shipping. But heck, that's all you do, we're not playing ping pong you know. So now you will have your two separate special purpose cells. You have a safe spot to prepare and receive shipments, repalletize and replace banding, mark containers, and perform visual inspections. (Since no one told you to "repair" those 7.62s and grenades, I guess you can visually inspect them in your new maintenance cell). Of course you will tell your Brigade Safety Officer about your new plans. The Safety Officer will check on external quantity distance requirements, help you update your composite risk management worksheets, and start the process to obtain a new site license.

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Oh yeah, now you only have 14 cells to store your 60,000 lbs NEW. You know no one is going to build any new cells for you, at least not anytime in your near future. Then you remember that the 1.4 stuff doesn't really count towards your NEW and it only requires a 50' standoff to combustible structures. You can take the 12 containers you removed from your new "special purpose" cells and put them along the outside walls of your BLAHA. All you need is 50' to storage and 50' to your structures. Now you can store your 1.4 material in those. If they would just give you one more helper, a ping pong table, and the pizza and soda job, life would be great.



The EXPLOSIVES SAFETY BULLETIN (ESB) targets the ammunition/explosives community. Contents are not necessarily the views of or endorsed by the Department of the Army, the Department of Defense, or any other US Government agency. The editorial content of the ESB is the responsibility of the US Army Technical Center for Explosives Safety (USATCES), McAlester, OK. Contributions are welcome. Contact information: E-mail address: mcal.dac.bulletin@conus.army.mil. Postal address: Explosives Safety Bulletin, ATTN: JMAC-ESM, 1 C Tree Road, Bldg 35, McAlester, OK, 74501-9053. Phone: (918) 420-8771, DSN 956-8771. Datafax: (918) 420-8503, DSN 956-8503.

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PROPER PRIOR PLANNING PREVENTS POOR PERFORMANCE

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Review and approval of explosives safety site plans (ESSPs) can be a lengthy process especially if the ESSP involves protective construction. It is imperative that preparation and review of ESSPs begin at the earliest possible date to avoid delays in construction/renovation projects or the start of production of ammunition items. Several recent ESSP reviews here at USATCES have suggested that ESSP preparation and submission could/should have begun much earlier than what actually occurred. At least one of these submissions has resulted in extended delays to production of an ammunition item that is in high demand for training troops headed for the theater of operations. These delays could have been avoided if the ESSP was prepared and submitted at the earliest possible date rather than shortly before construction was scheduled to begin.

It is highly recommended that program/project managers consider whether an ESSP will be required early in the development of a new ammunition program to ensure that ESSPs are submitted in a timely manner. There is a high likelihood that an ESSP will be required if the project/program involves production at a different location than used in the past or if the project involves a new item that has not been produced at the chosen facility.

Firefighting DOT Class 1 Materials - Army Perspective

By: Risk Management Division
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Historical Perspective -

“Fire, not accident impact, is the principle threat to munitions transported by rail and is the most likely cause of an initial explosion. Once begun, however, explosions can spread (propagate), primarily due to high-speed fragments striking nearby munitions.” This quote is taken from the “Safe Transport of Munitions Report (STROM)” June 1981, MTMC Report MTT 81-1.* The STROM study was started in 1978 and was a direct result of the significant explosives accidents at Roseville, CA, 28 April 1973 and Benson, AZ, 23 May 1973 (within one month of each other). On 4 August 1985, a car vs. semi collision on I-40 near Checotah, OK, ignited gasoline from the car’s ruptured tank. The resulting fire cooked off the 2000 -lb bombs the truck was carrying and left a crater 35 feet across and 27 feet deep, on I-40! The explosives accident at Doha, Kuwait, in 1991 started as a fire in a Field Artillery Ammunition Supply

Vehicle (FAASV) that, in time, cooked off the munitions on board the FAASV. The STROM report was focused on rail transportation, but probably understated the relationship between fire and accidental munition detonations. The first sentence from the STROM quote could be shortened and modified to read, **“Fire is the principle threat to munitions in storage or transportation.”** Most ammunition is designed to have two independent safety mechanisms to assure safety in transportation, storage or use. But if you expose that munition to

*What was Military Traffic Management Command (MTMC) is now Surface Deployment and Distribution Command (SDDC). Sidebar - The STROM report was a significant factor in getting the railroads to switch from oil bath journal box wheel bearing lubrication to roller bearings in use today.

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the thermal heating effects of a fire, in time, that munition will have an energetic reaction, despite the presence of mechanical safeties. The holy grail of hazard classification, hazard division 1.6, is an explosive that when exposed to a fire only burns. We are making progress toward 1.6, but we're not there yet.

Army Perspective –

- If fire is supplying heat to munitions, do not fight the fire, evacuate and warn others as you evacuate.
- Fight fires near ammunition and explosives (but not involving ammunition and explosives) if there is sufficient manpower and firefighting apparatus to extinguish the fire before it supplies heat to the munitions. If manpower or firefighting apparatus is inadequate to suppress the fire before it reaches the ammunition, then evacuate and warn others as you evacuate.
- If a fire involves a vehicle, railcar or structure known to only contain ammunition hazard classified as 1.4S, these fires can be fought based on the risk assessment of the on-scene commander. Remote streams and available cover should be used if fighting a fire involving 1.4S ammunition.

Don't all services have the same perspective?

No. The Navy in their OP5, which addresses explosives safety ashore, has guidance similar to the Army's, but afloat the Navy has no choice and will fight shipboard fires even if they are supplying heat directly to the munitions. The Army and Air Force can run away from their ammunition fires, the Navy might not be able to run away from theirs.

DOT Placards vs. DOD Fire Symbols

Safety regulations require the use of DOD "fire symbols" on installations for explosives hazard communication purposes. DOD symbols will actually convey more information at a distance to a responding firefighter than DOT placards. The specific shapes, octagon for 1.1, railroad cross buck for 1.2, triangle for 1.3 and diamond for 1.4 will give you the highest hazard division present whereas, you'll need to get close enough to read the lettering on the DOT placard to determine what the applicable hazard class involved is. Among firemen, there is a saying: "If you can read the letters on a DOT placard, then you're too close." Not all firemen understand the hazard associated with fire symbols, but all firemen understand DOT placards and are trained in the use of the current Emergency Response Guidebook (ERG).

Consider that within the Army, fires of only one very specific hazard division (1.4S) will be fought, and that many firemen will react based on placard color alone. It probably doesn't matter what system of hazard communication (DOT placards vs. DOD fire symbols) is used, as the end result will be the same. If the firefighter sees a fire symbol #4, he/she still does not know if it is 1.4B, 1.4C, 1.4G or 1.4S (only allowed to fight fires involving 1.4S). If the firefighter sees an orange DOT placard, chances are he/she isn't going to get any closer to read the sign but will act (probably evacuate) based on the color of the DOT placard.

On the next page is a simplified diagram that shows which ERG guide to use (there are only two, 112 and 114 to consider) given a fire to a structure or vehicle marked with a DOT placard or a DOD fire symbol. On the following page are possible conditions and recommended courses of action based on those conditions. Share this with your local fire department. For printable photo images of the handouts, [click here for the fire symbols](#) and [here for the instructions](#).

Handouts on pages 6 and 7



Respond IAW

North American Emergency Response Guide (NAERG) #112



Respond IAW

NAERG #114

SITUATION: Fire near, but not involving or supplying heat to munitions.

ACTION: Fight these fires only if sufficient personnel and equipment are on hand to extinguish the fire before it involves the munitions or supplies heat to the munitions. If sufficient personnel/equipment is not available, then evacuate to the distances specified below. NOTE: If the fire is known to only involve ammunition that is hazard classified as 1.4S, these fires can be fought using available cover.

SITUATION: Fire involving and/or supplying heat to the munitions.

ACTION: **DO NOT FIGHT THESE FIRES.** Evacuate all personnel, including emergency responders, to the evacuation distances immediately. NOTE: If the fire is known to only involve ammunition that is hazard classified as 1.4S, the fire can be fought. Use available cover or remote streams if possible.

EVACUATION DISTANCES:

Building - 4000 ft or 3/4 mile (1500 ft for 1.4 munitions)

Rail Car - 5000 ft or 1 mile (1500 ft for 1.4 munitions)

Tractor Trailer - 5000 ft or 1 mile (1500 ft for 1.4 munitions)

SITUATION: Transportation accidents, not involving fire.

ACTION: Deploy hose lines to fight any fire that may start. **DO NOT TOUCH OR DISTURB ANY MUNITION THAT WAS PROJECTED FROM THE SCENE.** Secure area to prevent anyone from touching or moving munitions. Do not use a radio within 330 ft (100 meters) of any munition. Call the Army Operations Center (703) 697-0218/0219 for assistance.

SITUATION: Post Fire/Detonation Actions.

ACTION: **DO NOT TOUCH OR DISTURB ANY MUNITION THAT WAS INVOLVED OR PROJECTED FROM THE FIRE/DETONATION.** Tape off and secure a wide area that includes all munitions that were projected from the scene. Do not use a radio within 330 ft (100 meters) of the site or from any projected munition. Call the Army Operations Center (703) 697-0218/0219. Report the conditions and request assistance from Explosives Ordnance Disposal (EOD). Do not perform overhaul operations (intensive search for embers).

DDESB's 1st Assessment of the Army Explosives Safety Management Program

By: Explosives Safety Knowledge, MEC,
and Chemical Division DSN 956-8867

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The first year for the Department of Defense Explosives Safety Board's (DDESB) evaluation of the US Army's Explosives Safety Management Program (ESMP) was concluded at the end of FY 2009. This evaluation program replaced the former DDESB surveys, which were conducted on each and every installation worldwide. During this inaugural year, the DDESB performed a "program" review by visiting with Office of the Director of Army Safety, the US Army Technical Center for Explosives Safety (USATCES), two Army Command (ACOM) HQs, two Army Service Component Command (ASCC) HQs, two Direct Reporting Unit (DRU) HQs and subsequently a sampling of installations/tenants responsible to these headquarters.

To view the 2009 Army Evaluation "[click here](#)".

As a result of the completion of the DDESB review of the Army ESMP, the Office of the Director of Army Safety has initiated DA-Level taskers and assigned responsible entities to address the issues provided in the report. If your organization was a recipient of one or more of the taskers, please pay close attention to the suspense dates!

Here is a fictitious example of the stop light format assessing the sixteen elements within the four programmatic areas at an installation:

Management	Plans, Policies, Procedures	Execution, Operations	Execution, Operations Support
1.1 Organization and Staffing YELLOW	2.1 Site Planning GREEN	3.1 Facility Conformance YELLOW	4.1 Emergency Response RED
1.2 Tenants YELLOW	2.2 Master Planning YELLOW	3.2 Ranges WHITE	4.2 Inspections, Evaluations, Audits, Surveillance YELLOW
1.3 Contractors WHITE	2.3 Accident Prevention Program GREEN	3.3 Demilitarization and Destruction RED	4.3 Facility Maintenance YELLOW
1.4 Risk Stewardship RED	2.4 Explosives Safety Issuances YELLOW	3.4 Records Management GREEN	4.4 Training GREEN

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The stoplight color keys used by the DDESB include:

- **Green**
 - Overall Satisfactory Processes
 - May Have a Few Minor Issues
- **Red**
 - Systemic Violations of DOD Criteria
 - Imminent Danger to Workers or Public
- **Yellow**
 - Potential Process Weakness
 - Issues, but no Specific DOD Criteria
- **White**
 - Not Applicable or Not Evaluated

Some examples of the Findings/Issues/Concerns raised by the evaluation team at installation level include (but not limited to):

- “There was no documentation evident that described the roles of Garrison and Tenants.”
- “The Installation did not have DDESB-approved site plans for all explosives facilities.”
- “The explosives limits listed on several facilities’ explosives licenses exceed those approved by the DDESB.”
- “Explosives mishap incidents between ___ and ___ were not reported although munitions were involved.”
- “POV parking lots were located too close to Potential Explosion Site (PES).”
- “Fire Department is not informed about Ammunition and Explosives movements when they occur.”
- “Risk assessment and Certificate of Risk Acceptance (CoRA) severely underestimated the potential losses if an explosives accident were to occur.”

Some examples of noted Strengths at installation level included (but not limited to):

- “Training program.”
- “Good Housekeeping.”
- “Range program very strong and comprehensive.”
- “Lightning Protection System (LPS) maintenance records have improved tremendously since last year and need to continue as such.”
- “Excellent Safety working relationships.”
- “Good working relationship between government staff and contractor.”

DDESB’s focus during FY 2010 and FY 2011 will be on the Navy and Air Force’s ESMPs. Now is the time that all installation explosives safety professionals should assess and improve their respective explosives safety posture to ensure compliance with the tenets of the current regulations. The Defense Ammunition Center’s Logistics Review and Technical Assistance Office executes the compliance check of the Army’s ESMP (100% of Army installations over a four-year cycle) during their scheduled reviews and verification of the corrective action plans generated by historical DDESB surveys or current ESMP evaluations. USATCES is chartered and available to provide additional assistance.

Accident Lessons Learned

By: Explosives Safety Knowledge, MEC,
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Undocumented Ammunition: A Documented Hazard!!

While conducting an inventory of items at an ammunition holding facility, one Soldier was killed and another injured by the functioning of a MK3A2 offensive hand grenade (DODAC 1330-G911). The involved grenade lot had been suspended and designated for disposal three years earlier due to low pull-pin tension, and should not have been in the hands of troops.

The unit's ammunition had been inspected less than a month prior to the incident. Although some of the unit's lots were marked due to being in a suspended status, this lot was not included among those documented assets, nor in fact even recorded as being in the hands of the unit at all.

It is imperative that all ammunition and explosives be accounted for from cradle to grave. Failure to maintain accountability can cause Soldiers to be injured or killed by ammunition and explosives that have been suspended/restricted. Two possible causes for losing accountability of ammunition are:

- Inattention to accountability due to the demands of other assigned duties, particularly before and during the move into theater;
- An unofficial, undocumented practice of incoming units "falling in" on extra ammunition that has been left behind by units rotating out. This surplus ammunition is not picked up to record, but is nevertheless kept on hand rather than being turned in, based on the unit's desire to have as much ammunition available as possible, even if it is not properly accounted for, or if its safety status is uncertain.

Ammunition with lost accountability will not receive the periodic inspections required to ensure continued serviceability, nor will it be properly found, segregated, and taken out of use based on notifications of restriction or suspension because of functioning defects or hazardous conditions. Since designated unit ammunition custodians are the individuals with the best view of the situation through use of tools such as the Property Book Unit Supply Enhanced (PBUSE) system, it is essential to educate them in the potential dangers of using ammunition with lost accountability. Surveillance, logistic assistance, and ammunition management personnel can also assist new units in these education efforts, as well as in researching the ammunition used by previously emplaced units, in order to properly identify, locate, and document any lots that are in a suspended or restricted status.

In addition to the emphasis being placed on this issue by senior leaders, higher-level NCOs and warrant officers can also be effective in initiating change in the accountability practices of Soldiers on a local level. Proper attention by all involved organizations and personnel will help to assure that maximum ammunition visibility and (especially) Soldier safety are consistently maintained.

Accident Shorts

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**By: Explosives Safety Knowledge, MEC,
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Soldier was test-firing a .50-caliber machine gun at the test-fire pit, the first round exploded in the weapon due to improper setting of weapon headspace and timing, damaging the gun, and causing minor injuries to the Soldier.

Soldier was test-firing a .50-caliber machine gun when an explosion occurred, and shrapnel from the cartridge case pierced the Soldier's thigh. Examination of the weapon indicated that it appeared to lack proper lubrication.

Following the second order of fire with a 5.56mm M249 light machine gun (Squad Automatic Weapon) on a firing range, Soldier started to clear the weapon, and noted that there was still a round in the chamber. Soldier opened the weapon cover without removing the clearing rod assembly from the weapon barrel, putting the weapon on Safe, or locking the charging handle to the rear. Soldier pulled the weapon charging handle and the round in the chamber exploded, with metallic fragments causing lacerations to the Soldier's face.

A unit was burning powder, while their truck (which also contained powder) and an attached trailer were located approximately 12 feet away. High winds caused the fire to spread to the truck and its contents, resulting in the total loss of the truck and repairable damage to the trailer.

Personnel were sorting through turned-in range residue when one of them picked up a smoke grenade that was missing its spoon, and also did not have the safety pin present, but still had the original tape seal on the bottom of the grenade. At that point, the grenade functioned, blowing off the top of the grenade, which struck the employee in the chest. A second individual was struck in the arm by a foreign object, and a third individual suffered an asthma attack from inhalation of the smoke generated by the grenade's functioning.

As a scooper box was being changed during production of primer mix, an employee dropped an explosives-filled Velostat cup, causing a detonation that injured the individual who had been holding the cup, as well as another employee.

Over 1,700 live rounds had been fired from an M240B 7.62mm machine gun when a misfire and weapon stoppage occurred. The gunner waited five to ten seconds, and then began immediate action by pulling the bolt to the rear, opening the feed tray cover, and looking down at the chamber. At that point, a round cooked off, sending fragments from the cartridge into the gunner's face.

Frequently Asked Questions

By: Risk Management Division
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Q

Can a temporary area for ammo laden vehicles be staged without having a site plan or lightning protection? This could be from 1-2 days to 3-4 weeks and is not on a specific range.

A

The area where the ammo laden vehicles are parked would be considered an ammunition holding area. Department of the Army Policy memo dated 13 Dec 1999, subject Requirements for Explosive Safety Site Plans for Ranges, paragraph 2c, requires range support facilities (e.g., ammunition holding areas, storage pads, resupply points, ammunition transfer points, loading docks, burn pans, and handling areas) that are designed, constructed and used for recurring ammunition operations and that are located on or near ranges require explosive safety site plans and lightning protection.

Q

I am trying to look up the shelf life and service life for a CAD/PAD. I do not remember the publication name or number. My URL (website) is no longer active.

A

You are looking for TB 9-1300-385. Go to <https://mhp.redstone.army.mil/>. This requires a CAC login. At the top of the page click on the "Notices" tab and go to TB 9-1300-385, Appendix D is where you will find the shelf/service life data. This is also your source for Ammunition Information Notices (AINs), suspension/restriction/release data, and a host of other information.

Q

The Intraline Distance (ILD) arc for Hazard Division (HD) 1.2.1 requires a minimum of 200 feet whether you have a Net Explosive Weight (NEW) of 1pound or 200 pounds. Why is this?

A

The minimum HD 1.2.1 distance of 200 feet for ILD is required for up to 300 pounds NEW. The DDESB has established this minimum based on testing and other data and has found that small quantities of HD 1.2.1 (< 450 pounds), in certain packaging configurations, will react in a manner more typical of a HD 1.1 event. For this reason, the minimum distance required to store HD 1.2.1 at Inhabited Buildings Distance (IBD), Public Traffic Route Distance and ILD has been set at 200 feet.